X-Press
National Aeronautics and Space Administration
NASA
Volume 48 Issue 1 Dryden Flight Research Center July 2006

Earth Science

Dryden capabilities contribute to demonstration missions

By Jay Levine
X-Press Editor

The Western States Unmanned Aircraft Systems Fire Mission is scheduled to begin Aug. 14, with Dryden and Ames Research Center, Moffett Field, Calif., assisting the U.S. Forest Service, said Robert Navarro, Dryden's Altair project manager.

The Altair, leased by Dryden from General Atomics Aeronautical Systems Inc., San Diego, will fly at altitudes of about 43,000 feet during missions, which will originate from the General Atomics facility at Gray Butte, Calif.

"Altair is carrying an instrument that will penetrate smoke and ash and transmit the imagery down to a station on the ground," explained Navarro, referring to the Autonomous Modular System, which uses multi-spectral line scanning that utilizes thermal channels.

"The images will be available to the fire commander, in near-real time, and will show the fire's hot spots to help efficiently use resources on the ground to knock down the flames."

In addition, software in the ground mission planning system will superimpose road maps and other valuable information in near-real time to assist firefighters in

See Science, page 4

EC05 0234-28 NASA Photo by Carla Thomas

General Atomics Aeronautical Systems' uninhabited Altair will begin a series of missions in August to prove the utility of unmanned air systems in carrying instruments to help field commanders gather information for use in battling summer wildfires in western states.

BWB arrives at Dryden

■ 'Flying wing on steroids' could mark the shape of things to come in aviation

By Jay Levine
X-Press Editor

A low-speed, 8.5-percent-scale flight research prototype of Boeing Phantom Works' Blended Wing Body concept aircraft, also known as the X-48B, arrived at Dryden in June.

The X-48B is a subscale testbed for exploring and validating the structural, aerodynamic and operational advantages of a futuristic aircraft design called the blended wing body, or BWB. It is similar to a flying wing, an airplane shaped entirely like an airfoil without a conventional fuselage or empennage. Flying wing concepts of the 1940s looked like propeller-driven or jet-powered boomerangs. The BWB design suggests a flying wing on steroids, with several distinguishing features.

The front section of a full-scale BWB airplane, containing the cockpit, extends forward of the wing's leading edge while the central portion encompasses the passenger or cargo compart-

See Blended Wing Body, page 15

EC06 0107-05 NASA Photo by Tony Landis

Ian Brooks, a Cranfield Aerospace employee, works on the Boeing Phantom Works X-48B Blended Wing Body aircraft. The aircraft and a second X-48B used in Langley Research Center, Hampton, Va., wind tunnel tests, arrived at Dryden in June. The low-speed, 8.5-percent-scale flight research prototype is expected to begin a series of research flights later this year or in early 2007.

Inside

Constellation:

Program for human and robotic exploration of the moon and Mars will involve all NASA field centers

NASA News Services

In a June 5 briefing broadcast agency-wide, NASA officials outlined agency and center responsibilities associated with the Constellation program for human and robotic exploration of the moon and Mars.

The distribution of work across NASA centers reflects the administration's intention to productively use personnel, facilities and resources from across the agency to accomplish space exploration goals.

"Our past experiences have provided the foundation to begin shaping the space exploration capabilities needed to create a sustained presence on the moon and on to Mars," said Scott Horowitz, associate administrator for the Exploration Systems mission directorate. "Our programs and projects are evolving as we develop the requirements to execute the vision for space exploration. At the same time we are aligning the work that needs to be accomplished with the capabilities of our NASA centers."

In addition to primary work assignments each center will support moon and Mars surface systems conceptual designs. Centers also will support additional Constellation program and project activities. In the briefing, center assignments were described as follows:

Ames Research Center, Moffett Field, Calif., leads the crew exploration vehicle Thermal Protection System Advanced Development project. Ames is developing information systems to support the Constellation program's Safety, Reliability and Quality Assurance office.

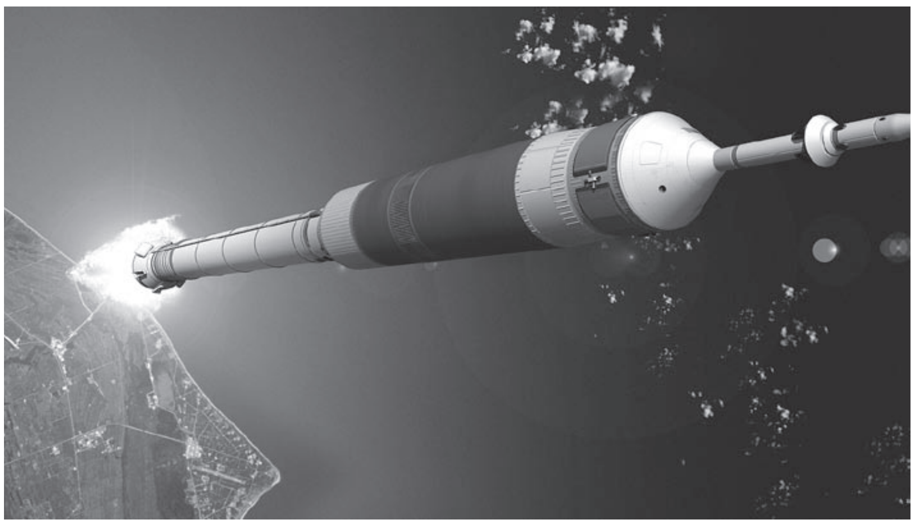
Dryden leads CEV Abort Flight Test integration and operations, including abort test booster procurement and integration with the flight test article.

Glenn Research Center, Cleveland, leads the CEV Service Module and Spacecraft Adapter integration, providing oversight and independent analysis of the prime contractor's development of these segments.

Glenn also has lead responsibility for design and development of several crew launch vehicle upper stage systems.

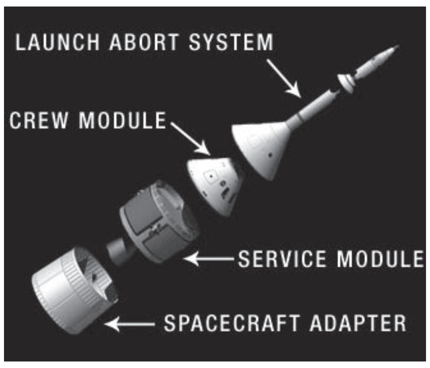
Goddard Space Flight Center, Greenbelt, Md., provides co-leadership of the Constellation program's System Engineering and Integration Navigation team and Software and Avionics team.

The Jet Propulsion Laboratory, Pasadena, Calif., leads a multi-center activity in support of the Mission Operations project to plan systems engineering processes related to operations development and preparation. JPL provides co-leadership for the Constellation program office Systems Engineering and Integration Software and Avionics team.



NASA Illustration

The above illustration shows the Crew Exploration Vehicle heading out for a mission. The illustration below shows how CEV elements stack up.



NASA Illustration

Johnson Space Center, Houston, hosts the Constellation program, the CEV project and the Mission Operations project. Constellation program staff manages and integrates the program and all related projects. The CEV project office manages and integrates all CEV elements, including prime contractor work. The Mission Operations project office manages and integrates all activities related to mission operations.

Kennedy Space Center, Fla., hosts the Ground Operations project. All activities related to ground operations for the launch and landing sites, including ground processing, launch and recovery systems will be managed by Ground Operations program staff.

Langley Research Center, Hampton, Va., leads Launch Abort System integration supporting the CEV project, providing oversight and independent analysis of the CEV prime contractor's development of the system. Langley leads the Command Module Landing System Advanced Development project for the CEV and provides vehicle integration and CEV test article module development for the CLV Advanced Development flight test-0.

Marshall Space Flight Center, Huntsville, Ala., hosts the Constellation launch vehicle projects. The projects are responsible for management of all CLV and cargo launch vehicle-related activities. Marshall provides the CLV first stage design, and is responsible for launch vehicle demonstration testing including the Advanced Development flight test-0.

Stennis Space Center, Miss., manages and integrates rocket propulsion testing for the CLV project. Stennis staff leads sea-level development, certification and acceptance testing for the upper-stage engine; sea-level development testing for the upper-stage main propulsion test article; and sea-level acceptance testing for the flight upper-stage assembly.

While these decisions will influence budget and personnel allocations at the centers, detailed estimates of these will not be available until after prime contractors are formally selected for the program's major projects, such as the crew exploration vehicle, crew launch vehicle and cargo launch vehicle. Information about the Constellation program and a detailed listing of the work assignments at each the center are available at http://www.nasa.gov/constellation.

Aero Gallery is now open

From the cockpit, Dryden Center Director Kevin Petersen offers a handshake and a go-for-flight to Public Affairs Director Fred Johnsen at the newly opened Aerospace Exploration Gallery. The facility, a project of the NASA Aero Insitute and the Dryden Public Affairs office, is located at Palmdale Boulevard and Sierra Highway. It features historical artifacts as well as displays highlighting current work at the center, and is now open to the public Tuesday through Thursday from 9 a.m. to 3 p.m.

ED06 0065-50 NASA photo by Tom Tschida

News at NASA

Clock ticks slowly for ozone layer

The Antarctic ozone hole's recovery is running late. According to a new NASA study, the full return of the protective ozone over the South Pole will take nearly 20 years longer than previously expected.

Scientists from NASA, the National Oceanic and Atmospheric Administration and the National Center for Atmospheric Research in Boulder, Colo., have developed a new tool, a math-based computer model, to better predict when the ozone hole will recover.

The Antarctic ozone hole is a massive loss of ozone high in the stratosphere that occurs each spring in the Southern Hemisphere. The hole is caused by chlorine and bromine gases in the stratosphere that destroy ozone. These gases come from manmade chemicals such as chlorofluorocarbons, or CFCs.

The ozone layer blocks 90-99 percent of the sun's ultraviolet radiation from making contact with Earth. That harmful radiation can cause skin cancer, genetic damage, and eye damage, and harm marine life.

For the first time, a model combines estimates of future Antarctic chlorine and bromine levels based on current amounts as captured from NASA satellite observations, NOAA ground-level observations and NCAR airplane-based observations, with likely future emissions, the time it takes for the transport of those emissions into the Antarctic stratosphere and assessments of future weather patterns over Antarctica.

The model accurately reproduces the ozone hole area in the Antarctic stratosphere over the past 27 years. Using the model, the researchers predict that the ozone hole will recover in 2068, not in 2050 as currently believed.

Dominguez nominated to new post

Olga M. Dominguez is the new assistant administrator for the Office of Infrastructure and Administration.

In her new position, Dominguez leads the agency infrastructure and facility programs and policies in support of NASA's long-range needs. In addition, she manages the Headquarters operations and institutional activities that support Headquarters as an institution. She also leads the NASA Ombudsman program.

Dominguez has been with NASA for nearly 16 years. In that time, she has had many roles. Most recently, she served as deputy assistant administrator for the Office of Infrastructure and Administration.

Prior to this position, she was director of the Environmental Management Division, responsible for leading agency environmental policy and programs. She joined NASA Headquarters in 1990 and became a member of the Senior Executive Service in 1998.

Explaining Dryden's view

Petersen treks up the Hill with lawmakers, astronauts

By Beth Hagenauer
Dryden Public Affairs

Dryden Center Director Kevin Petersen participated in "NASA Days on Capitol Hill" in Washington, D.C., May 23 and 24. Together with officials from other NASA centers and a cadre of astronauts, Petersen visited members of the U.S. Congress to offer perspective on the agency's space exploration goals.

During the two-day visit, Petersen traveled among the Longworth, Cannon and Rayburn House office buildings to meet with eight members of the California congressional delegation and five congressional staff members.

In his conversations with legislators, Petersen emphasized how the agency's goals encompass every NASA field center and affirm the nation's commitment to human space exploration. He also explained Dryden's contribution to the endeavor. The NASA Explorer School program was outlined to congressmen and women who were unfamiliar with the initiative but have NES programs located in their districts.

U.S. representatives from California with whom Petersen met included Bill Thomas (R-22nd dist.), Devin Nunes (R-21st dist.), Howard P. "Buck" McKeon (R-25th dist.), Ken Calvert (R-44th dist.), Maxine Waters (D-35th dist.), John Campbell (R-48th dist.), Mike Honda (D-15th dist.) and Bob Filner (D-51st dist.).

Accompanying Petersen was astronaut Alan Poindexter, who is scheduled to fly in STS-120; Cam Martin, from Dryden's External Affairs office; and Stephan McGinley of the NASA Legislative Affairs office.

Submitted photo

During a recent trip to Capitol Hill, Center Director Kevin Petersen spoke with U.S. Rep. Bill Thomas, right, about NASA's goals for space exploration. Astronaut Alan Poindexter, left, accompanied Petersen to the Hill.

Ready for anything

Drill focuses on refining processes

By Jay Levine
X-Press Editor

NASA 7's left engine starts slowly. A puff of smoke materializes, and a finger of flame shoots out. The aircraft fire suppression system intended to activate in such a situation fails and maintenance and cockpit crews are concerned because the fire is nearing the aircraft's fuel tank.

It happens so fast that three people are burned and another five suffer smoke inhalation. Help is on the way, but four minutes have passed and Dryden maintenance and security people are scrambling with radios and first aid kits to do what they can. It becomes obvious that all eleven people – all passengers and crew – will need to be transported to local hospitals.

Sound somewhat unlikely? It may be, but what-ifs and what-do-we-do thens played out in a May 24 "tabletop" exercise aimed at identifying which of the center's established safety procedures would work in such a scenario and which needed improvement. About a dozen people representing different Dryden departments took part in the exercise.

"It gave participants awareness of responsibilities," said Jack Trapp, Dryden's Acting Aviation Ground Safety Manager and one of the facilitators of the activity. "Going through the procedures, we were able to find out where the shortcomings are and where we can add clarity to our responses."

The exercise addressed obvious issues such as containing and cleaning up hazardous materials, establishing safe parameters and alerting Dryden and NASA officials to such details as how family members are to be notified and how employees will be allowed access to vehicles left after they were injured and taken to

See Drill, page 16

ED06 0081-1 NASA Photo by Tom Tschida

About a dozen Dryden employees from departments throughout the center attended a May 24 "tabletop" exercise aimed at assessing disaster preparedness. The drill was designed to refine procedures and identify areas that could use improvement – before disasters strike.

ED06 0102-41 NASA photo by Tony Landis

Artist McCall visits Dryden

About 45 artists participating in the 20th annual symposium of the American Society of Aviation Artists June 19-24 were treated to a colloquium presentation at Dryden June 20 by famed aviation muralist Robert McCall.

McCall outlined his career as an aerospace artist then discussed his approach to developing three of his original murals now on display at the center – The Spirit of Flight Research, completed in 1977; Accepting the Challenge of Flight, completed in 1996, with which McCall is pictured above; and Celebrating One Hundred Years of Powered Flight 1903-2003, completed in 2003.

McCall joined the Army Air Corps of the 1940s with the intention of becoming a pilot, though he eventually became a bombardier. From the start, he said he was drawn to painting military gear, but "above all, I just loved airplanes."

PM Challenge seeks speakers

Plans for the fourth annual NASA Project Management Challenge are under way and organizers are seeking speakers to talk about their project management experiences.

The conference will be held Feb. 6-7 at the Moody Gardens Hotel and Convention Center in Galveston, Texas. The event is near Johnson Space Center, Houston, and is sponsored by the NASA Academy of Program/Project and Engineering Leadership, or APPEL. See http://pmchallenge.gsfc.nasa.gov/ for more details.

The contact person for speakers interested in participating is Niloo Naderi at 301-286-5694. She also can be reached by email at Niloofar.Naderi.1@gsfc.nasa.gov

Photo courtesy Karla Graves

Watch out for a mean Green

This Mojave Green rattlesnake slithered in front of the Arcata Program Control Office, Building 4846, on June 19. Air Force Security Police safely removed and relocated the snake.

The Mojave Green rattlesnake is venomous and can be very aggressive when disturbed. Be aware that there could be more snakes and be cautious when walking around Dryden and adjacent desert areas.

Science ... from page 1

seeing not only where hot spots are but also the best ways to reach them.

Altair research flights could include missions to Northern California, Washington, Oregon, Idaho, Utah, Arizona or "wherever the fire is," Navarro said.

Instrumentation on the Altair also includes a National Oceanic and Atmospheric Administration atmospheric gas-sampling tool.

Providing the tools

Altair is one of several Dryden research tools available to aid the Earth science community, said Bob Curry, acting director of Dryden's Science mission directorate, of which Dryden's work for the Earth Science Capability Demonstration is a part. Key aircraft assets such as the ER-2 and Altair as well as a Predator-class uninhabited air system, or UAS, that Dryden expects to acquire will be available for customer needs on airborne projects.

The Suborbital Office at NASA Headquarters provides Earth science researchers with access to Dryden's resources in areas such as atmospheric science, geology and land use for work involving such global problems as climate change and international pollution, Curry said. In addition to preparing new UAS platforms for science missions, he said Dryden is working to reacquaint the science community with the ER-2's utility and reliability. He'd like to see the ER-2 busy year-round for science missions again, as it was in the 1990s.

"The ER-2 is a highly unique airplane with complex, one-of-a-kind capabilities," Curry said. "Our contribution is to be able to provide airborne flight services reliably and to meet mission objectives within budget and on schedule."

Reliability in systems and research platforms is critical for scientists researching specific phenomena such as weather and geologic events occurring at certain locations and times of the year, he said.

"We've been asked to pursue the use of unpiloted air vehicles to help the Earth science community get their instruments aloft in different kinds of scenarios that just are not possible in piloted aircraft. Endurance – being able to fly for 24 hours or more – is just one scenario that is unique to the unpiloted aircraft," said Frank Cutler, Dryden's Earth Science Capability Demonstration project manager.

Another is the very hazardous scenario in which it would not be worth the risk to deploy piloted aircraft. A mission is planned for this hurricane season, for example, wherein a small UAS will be flown at low altitudes in a hurricane to collect data never before available to weather modelers.

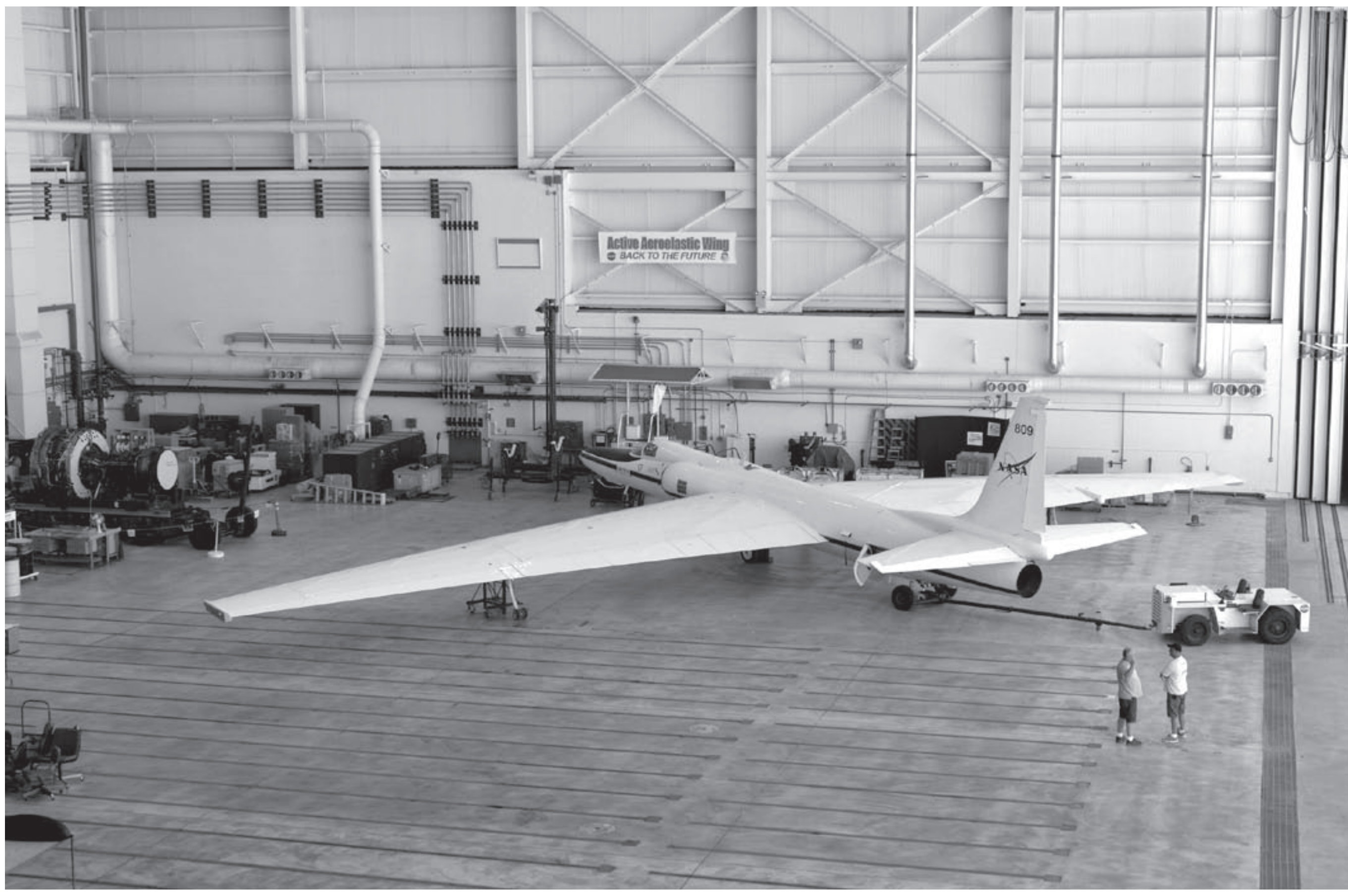
Developing new capabilities

In addition to research platforms and currently available technology, Dryden is helping to develop new technology enhancements for unpiloted aircraft that could present new possibilities.

Structural and navigational modifications are underway on the NASA G III aircraft for carrying new synthetic aperture radar. This new system will be capable of being flown repeatedly over any period of time through a predetermined 10-meter "tube" in the airspace, allowing researchers to detect and analyze minute changes in the Earth's crust, Cutler said.

This new capability, called the Repeat Pass Interferometry (a part of the UAV synthetic aperture radar, or UAVSAR) – may eventually be incorporated into a UAS platform. The new system could be especially useful, for example, to researchers investigating seismic fault lines. The Jet Propulsion Laboratory, Pasadena, Calif., is at work on the instrument and related data analysis tools while Dryden is developing the precision navigation system, structurally modifying the aircraft and designing pods to carry the UAVSAR instrument.

Adding this new technology to piloted aircraft like the G III is an efficient means of moving these technologies to UAS platforms, Cutler said. The UAVSAR ultimately could be transferred to a Predator-class aircraft. Developers of the system believe it can be refined even further to navigate the aircraft using the tool inside a one-meter tube, providing researchers with an even higher-resolution means of studying Earth's ever-changing crust.



ED06 0089-5 NASA Photo by Tom Tschida

The ER-2 is one of many assets available through the Dryden Science mission directorate for customers with research needs in the upper atmosphere. Dryden also is working to add new capabilities to its aircraft to accommodate new customers.

ED05 0234-13 NASA Photo by Carla Thomas

The Dryden-leased Altair flew a science mission last fall and will be a participant, along with Ames Research Center, Moffett Field, Calif., in the Western States Fire Mission in August. It is expected that the General Atomics Aeronautical Systems aircraft will continue playing a role as a key uninhabited air system available for use by Dryden's customers.

New data system

When Altair flies in August it will feature Dryden innovations like the Research Environment for Vehicle-Embedded Analysis on Linux capability, or REVEAL, a programmable gateway between onboard instruments and wireless communication paths to and from the aircraft.

In a nutshell, this new data system allows for high-tech, real-time capture and transfer of information from instruments onboard the aircraft to users or researchers on the ground. Information from the aircraft then can be enhanced with overlays such as digital weather and terrain maps to give researchers broad situational awareness of the environment within which the instruments are operating.

"We're working with the researchers to help them get their instruments on the appropriate aircraft platform," Cutler explained. "We offer to bring them onsite to look at the aircraft and understand what we're doing with it. Once we think we have a mission, we look to see what instruments group together to allow researchers to share costs to make it more affordable."

Building relationships

Dryden has a long history of working with UAS aircraft, excellent relationships with other test ranges and a thorough understanding of how to work with the Federal Aviation Administration, Cutler said.

"The FAA trusts us to do the right thing. If it were not safe, our own agency wouldn't allow it. They're banking on our reputation. Our safety-review processes are very important," he said. "The UAS activities of Dryden and its partners will undoubtedly help to shape how UAS operations become routine in the national airspace."

The FAA is currently undergoing reorganization aimed in part at setting up airframe certification and flight authorization procedures for UAS vehicles, Cutler said. Large-scale civil operations of UAS are complicated and will require time and patience to be safely developed, he added.

Further assessment

In the meantime, UAS capability assessment studies are ongoing to identify the types of technologies required to fulfill requirements and whether those technologies are available or will need to be developed, Cutler continued.

The Suborbital Science office at NASA Headquarters is Dryden's key customer, he said, and he anticipates a long and productive relationship that will evolve into exciting UAS science missions.

"We're currently assessing the possibility of UAS participation in the International Polar Year activities that are due to start in about a year," he said. The proposed polar mission would entail long-duration flights as well as the need to land on icy runways and cope with extreme weather conditions that constantly and quickly change.

"Can these systems operate in unforgiving environments?" Cutler asked.

That's part of the mission – determining the best way to get it accomplished.

Altair is seen as one of the center's workhorse UAS aircraft for science missions. It successfully completed an 18.4-hour NOAA project in November 2005, a high-altitude, long-endurance series of missions that entailed collection of air samples at various altitudes, missions 800 miles off the U.S. West Coast, enforcement patrol, use of high-resolution digital cameras for mapping, monitoring coastline erosion and counting coastal sea mammal populations.

"Information that UAS aircraft can help researchers gather will help to develop better models to predict what will happen next," Cutler said.

ED06 0103-48 NASA Photo by Tony Landis

Family Day

ED06 0103-31 NASA Photo by Tony Landis

Four-year-old Noah Bomben, son of Dryden pilot Craig Bomben, is ready for action.

Questions about what Mom and Dad do at work were answered for 380 kids who attended Dryden's Family Day events June 23.

In addition to seeing their parents' workplace, the next generation of scientists and engineers were introduced, or reintroduced, to some of the wonders of NASA aeronautics.

Several took the opportunity to try on flight suit life-support equipment. Later in the day they marveled as pilots wearing the same type of equipment flew by the back ramp in a NASA F/A-18 and T-34.

Family Day participants got up close and personal with the NASA 747 Shuttle Carrier Aircraft. Family members climbed aboard, sat in the pilot's chair and roamed the vehicle's cavernous midsection and rear.

The NASA 747 is used when a space shuttle lands at Dryden and must be transported back to Kennedy Space Center, Fla. The ferry flight's route from Dryden back to Kennedy varies depending on the weather.

Beside the behemoth 747 was the Astronaut Transport Vehicle, used to move astronauts recovering from the effects of space travel. After a shuttle flight, astronauts walk across a plank and directly into the transporter vehicle from the orbiter when

See Family Day, page16

ED06 0103-17 NASA Photo by Tony Landis

Above, a parent gets a Family Day photo to remember. Below, Joel Sitz sits in the NASA 747 cockpit with sons Ben, left, and Billy, right. Family Day attracted 380 visitors and helped raise funds for Dryden's 60th anniversary events with a bake sale and book sale.

ED06 0103-66 NASA Photo by Carla Thomas

NASA photo by Tony Landis

Items such as batteries, electronics, fluorescent light bulbs and lamps, appliances and aerosol cans are now considered hazardous waste and must be disposed of properly.

Battery disposal rules change

**Please note that all information provided in this article pertains to disposal of residential waste only. Dryden employees disposing of work-related hazardous or household waste must adhere to federal regulations and guidelines, which are not addressed in this article. All Dryden hazardous and household waste must be turned over to any Dryden chemical crib facility or disposed of by calling 661-276-7403.*

On Feb. 9 the California Environmental Protection Agency released a new waste rule that affects common household products, including batteries and other universal household waste. Universal household waste is classified as hazardous waste generated from a wide variety of sources, including such items as fluorescent lights, thermostats and small electronics.

The new rule stipulates that these products must be separated from regular trash and collected for safe disposal. Improper disposal of such items can lead to substantial environmental impact. Incorrect disposal of batteries, for example, may cause heavy metals to leach from solid-waste landfills, exposing the environment and water to lead or strong corrosive acids. Improperly released into the environment, batteries and other universal household waste products can lead to groundwater contamination from chemicals such as mercury, lead, acid, zinc, cadmium and other corrosive and flammable toxins.

There are many ways to protect the environment from improper disposal of common household products, starting with prevention. Before purchasing a battery or other universal waste product, be sure the purchase is a necessary one. Whenever possible, opt for rechargeable batteries. About three billion batteries are sold in the U.S. each year, which averages 32 per family or about 10 per person – many of them probably unnecessary.

The best way to properly dispose of household batteries, fluorescent lights, thermostats and other electronic devices is to take the items to a facility that accepts and recycles household waste. Web sites that indicate where disposal and recycling facilities may be located include:

- L.A. County – http://www.earth911.org
- Kern County – http://www.co.kern.ca.us/wmd/index.html
- California reference – http://www.calepa.ca.gov

The Cal EPA, the Department of Toxic Substances Control and the California Integrated Waste Management Board list other universal household waste in the new waste disposal rule: lamps that contain mercury, thermometers and novelty items like shoes with lighted soles, greeting cards and maze games that contain mercury. The list also includes electronic devices like computer monitors, televisions, phones and video cassette recorders. Also included are aerosol cans and appliances such as stoves, ovens, water heaters and furnaces.

ED04 0361-23 NASA Photo by Tom Tschida

The Active Aeroelastic Wing team demonstrated for the first time the use of wing warping for aerodynamic roll control with modern aircraft, while at the same time controlling structural loads.

Dryden's NASA Awards

Members of the Dryden family were honored June 6 during a ceremony held at the center, receiving plaques and medals from NASA Associate Administrator Rex Geveden and Center Director Kevin Petersen.

Three Exceptional Achievement medals were presented to Joseph D'Agostino, Paul J. Aristo and Stephen Corda for space shuttle return-to-flight work.

The citations read:

• D'Agostino – For exceptional achievement in preparing Dryden's Shuttle facilities to support Return to Flight.

• Aristo – For outstanding leadership and technical support of research projects such as the Lifting Insulation For Trajectory (LIFT) project furthering NASA's contributions to aeronautics and space.

• Corda – For exceptional leadership and management of the F-15B LIFT flight research team, in support of the shuttle Return-to-Flight program.

Two additional Exceptional Achievement medals were awarded to Michael P. Thomson and Steven L. Wildes.

The citations read:

• Thomson – For exceptional performance as Dryden's lead in successfully

See Awards, page 7

Joseph D'Agostino

Paul J. Aristo

Stephen Corda

Michael P. Thomson

Steven L. Wildes

Albion H. Bowers

Russell H. Davis

Patricia M. Kinn

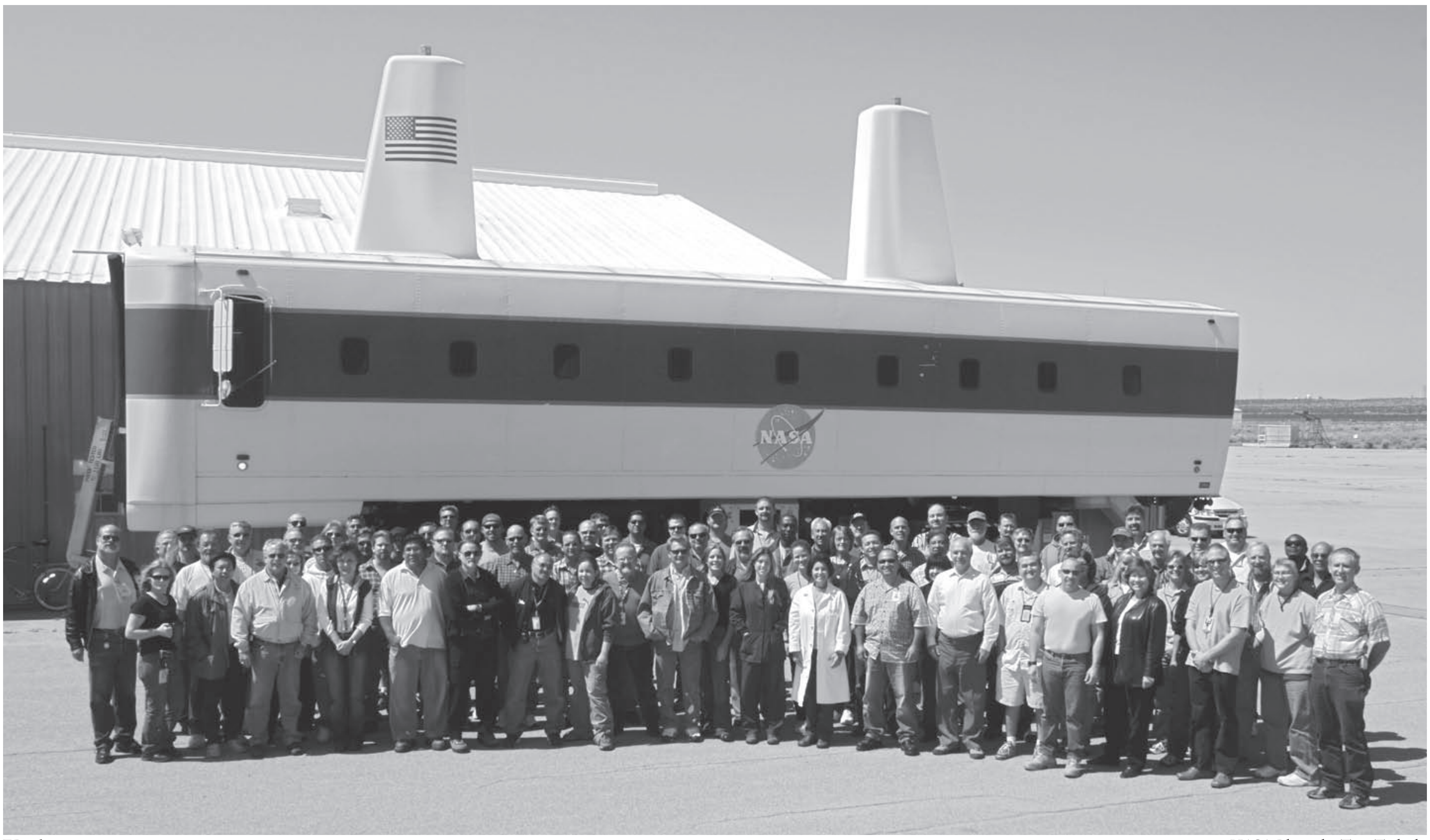
Laura A. Peters

John Carter

Susan B. Miller

Jerry S. Reedy

Michael Monahan



ED06 0091-1 NASA Photo by Tom Tschida

Dryden's Shuttle Support Group earned a NASA Group Achievement Award for sustained excellence during the two-and-one-half-year hiatus in shuttle flights, culminating in an extremely successful recovery during Discovery's return-to-flight mission.

Awards

... from page 6

transitioning the DC-8 Airborne Science platform aircraft to the Wallops Flight Facility and the University of North Dakota.

• Wildes – For developing a work order metrics system that has dramatically improved the quality of engineering and manufacturing support provided to projects.

During the ceremony, Albion H. Bowers, Russell H. Davis, Patricia M. Kinn and Laura E. Peters were honored with Exceptional Service medals.

The citations read:

• Bowers – For sustained demonstration of technical and leadership excellence in the conduct of nationally significant flight research projects.

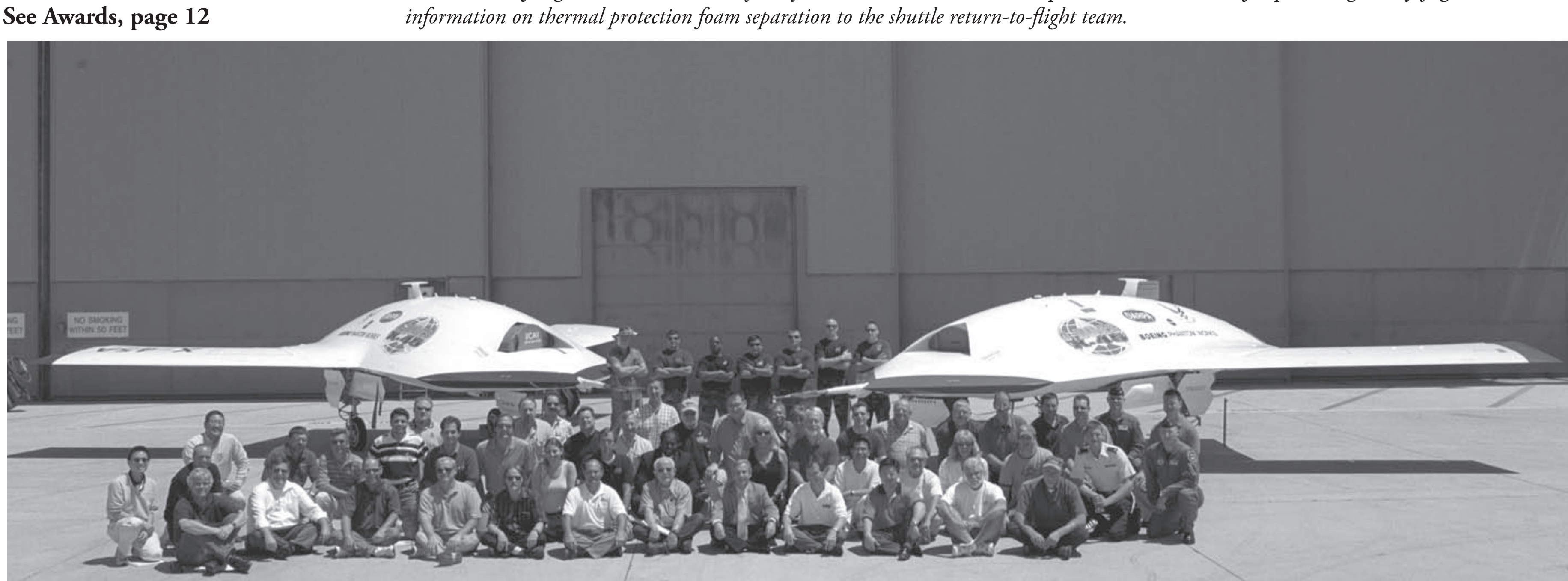
• Davis – For exceptional service as Dryden's procurement officer in developing innovative solutions to meet challenging Center issues.

• Kinn – For sustained and innovative performance in developing and maintaining flight scheduling procedures and

See Awards, page 12

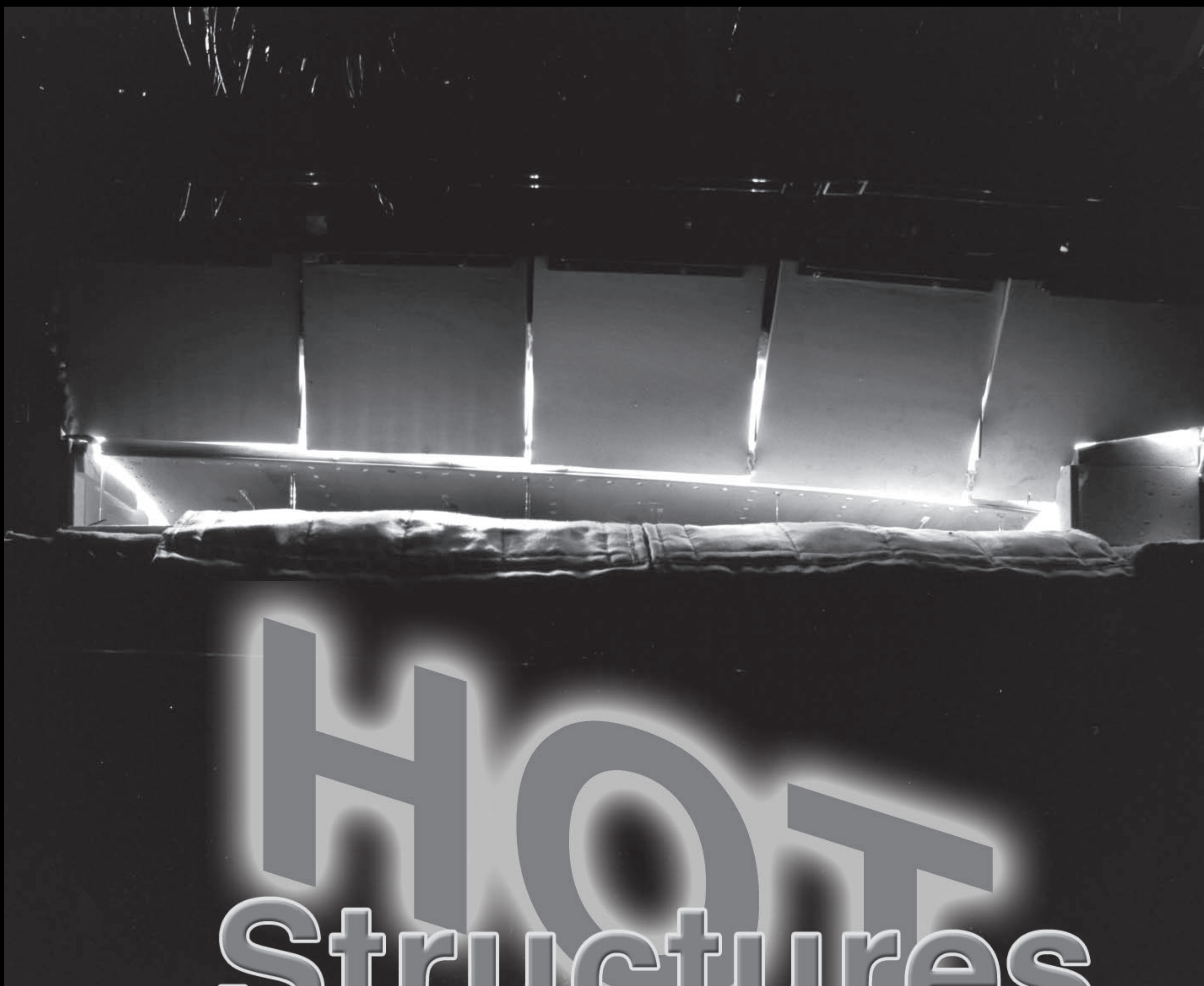
EC05 0056-2 NASA Photo by Tom Tschida

The F-15B Lifting Insulation Foam Trajectory Team earned a NASA Group Achievement Award for providing timely flight research test information on thermal protection foam separation to the shuttle return-to-flight team.



EC05 0135-1 NASA Photo by Tony Landis

Recognition was bestowed on the Joint Unmanned Combat Air Systems, or J-UCAS X-45 Team for achieving historic milestones, advancing the technology of autonomous air vehicles and demonstrating single- and multi-vehicle autonomous operations.



HOT Structures

Top image *(EC05 0183-11 by Tony Landis) is of the carbon-carbon X-37 flaperon qualification unit as it cools from a maximum test temperature of more than 2,500 degrees Fahrenheit.*

At right*, Dryden instrumentation specialist Anthony "Nino" Piazza installs temperature sensors on the carbon-carbon X-37 flaperon qualification unit using a thermal spraying technique. NASA photo courtesy of Larry Hudson.*

By Ja
X-Pre

I
up to
"Th
type
the o
lab th
Th
latest
faring
On
recen
space
NASA
Hunt
chani
gram
Resea
Dryd
space
Ke
Com
Inter
Techn
Newa
and t
Air F
Re
than
Com
heit.
flaper
nent
Th
contr
drag
and l
each
Fo
inclu
analy
verify
ture
ment
desig
elem
cond
ties o
Th
the c
in act
manu
tests
els as
vehic
Ab
cond
and a
So su
with
In
tested
desig
like s
that t
applic
37-lik
"T
perfo
cryog
degre
therm
testin
in the
"W
strum
ture f
meas
and c
Te
devel
sonic
instru
struc
desig
aids t
Hu

See

ny Levine
ss Editor

Dryden's Flight Loads Laboratory is one of the only government facilities available for researching mechanical and thermal loads simultaneously on everything from large structures or systems full-sized aircraft.

here are only a few places in the U.S. that can do this of large-scale testing within the government and we're nly one on the West Coast," said Larry Hudson, loads hermal structures test engineer.

is unique capability may soon be put to use testing the components and subsystems for hypersonic and space- g vehicles, Hudson said.

he application for the loads lab research can be seen in tly completed work on the X-37 prototype, a reusable vehicle being developed by the government. Once a A project (managed at Marshall Space Flight Center, tsville, Ala.), the Dryden lab completed thermal and me- ical testing on three key X-37 components when the pro- transitioned to management by the Defense Advanced arch Projects Agency, or DARPA. Also researched at en was a fourth test article considered critical to future vehicles with a design similar to that of the X-37.

y partners in the testing effort included The Boeing pany, Huntington Beach, Calif.; Science Applications national Corp., San Diego; Carbon-Carbon Advanced nologies, Fort Worth, Texas; General Electric Energy, ark, Del.; Materials Research and Design, Wayne, Pa., he Air Force Research Laboratory at Wright-Patterson orce Base, Ohio.

search on the three X-37 components involved more 30 tests during a two-year period from 2003 to 2005. ponents were heated to more than 2,500 degrees Fahren- The components tested included a carbon silicon carbide ron subcomponent, a carbon-carbon flaperon subcompo- and a carbon-carbon flaperon qualification unit.

e flaperon accounts for two of the X-37's five flight rol surfaces. It is used for roll control and to adjust for during atmospheric flight and airspeed during approach anding. The flaperons are located on the trailing edge of wing.

r the X-37 flaperon qualification unit, test objectives ded verifying the structural model and finite element sis, or FEA, used to design the carbon-carbon flaperon; ving the thermal analysis model used to predict tempera- distributions and time histories in the flight environ- ; demonstrating the manufacturability of the flaperon n and evaluating the structural performance of design ents under representative flight, thermal and static load itions, and verifying the mechanical and thermal proper- f carbon-carbon materials used in the design analysis.

e thermal and mechanical loading conditions applied to omponents simulated what the parts would encounter ual flight. The tests qualified the flaperon design and facturing methods for flight, and information from the will be used in evaluating thermal and loading mod- sociated with creating parts for hypersonic and space les.

out 15 to 20 people, including customer staff members, ucted the research. Loads lab staff designed, fabricated ssembled unique equipment used to perform the tests. ccessful was the team that it was recognized at Dryden a 2005 NASA Group Achievement Award.

addition to that work, Hudson said the loads lab also d a Next-Generation Launch Technology program item ned as a body flap envisioned for use in future, X-37- pace-faring vehicles. Heating and mechanical loading of test article were not part of baseline X-37 tests, but the ed thermal and mechanical loads were derived from X- ke re-entry trajectory information.

he Flight Loads Laboratory has the unique ability to rm large-scale, thermal structure testing ranging from genic temperatures to temperatures up to the 3,000- ees-Fahrenheit range. We also have the ability to define nal and mechanical loading on structures. We can do our g in the air or in an inert atmosphere (artificially created e lab setting)," Hudson said.

We have unique skills in the area of high-temperature in- mentation – specifically, the application of high-tempera- fiber optic strain sensors and thermocouple temperature urements on advanced materials, such as carbon-carbon arbon silicon-carbide."

chnology researched in the loads lab could be used for oping new capabilities for re-entry vehicles and hyper- atmospheric vehicles, Hudson said. High-temperature umentation on carbon-carbon and carbon silicon-carbide tures is a unique discipline that provides analysts and ners with valuable strain and temperature data, which hem in validating analysis and models.

dson sees the information gathered from X-37 research

e Hot Structures, page 16

NASA Photo

At left, Dryden technicians prepare the loads laboratory heating system for thermal testing.

EC04 0151-09 NASA Photo by Tony Landis

At left, *the carbon silicon-carbide X-37 flaperon subcomponent glows as it is heated during research at Dryden to test its thermal and mechanical durability.*

Below *are Craig Stephens, left, and Larry Hudson with a flaperon similar to the one designed for the X-37.* ***Bottom***, *the X-37 is pictured.*

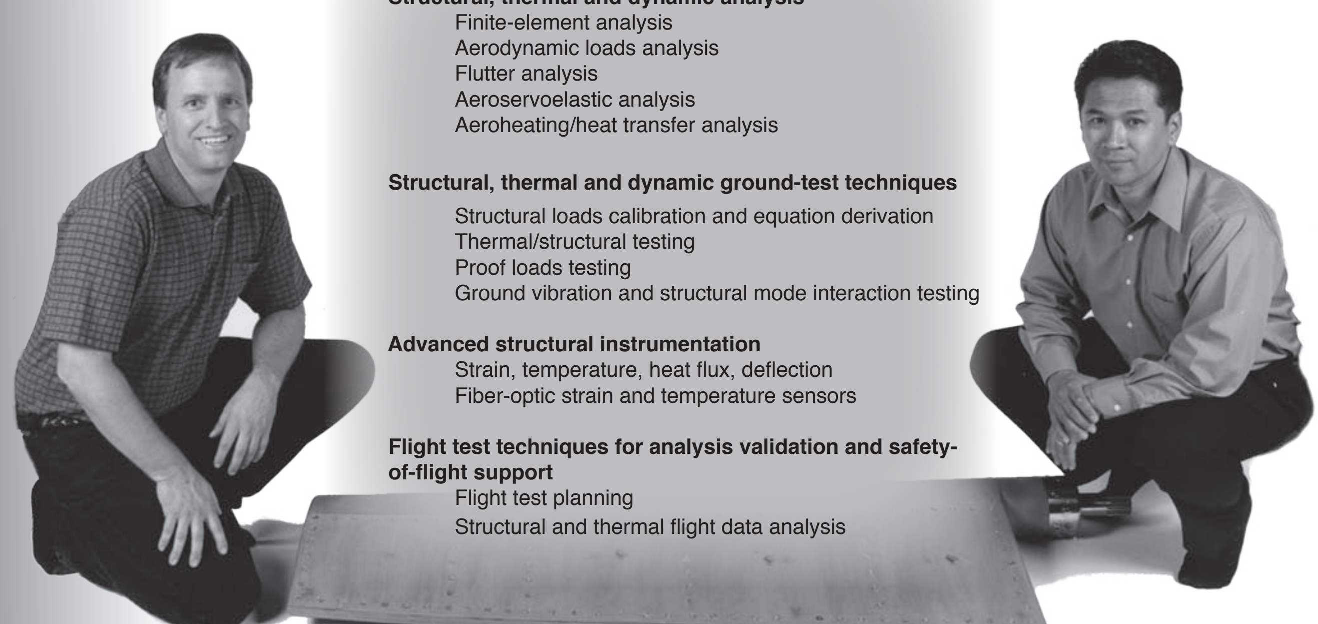
Key Dryden Aerostructure Branch Capabilities

Structural, thermal and dynamic analysis
- Finite-element analysis
- Aerodynamic loads analysis
- Flutter analysis
- Aeroservoelastic analysis
- Aeroheating/heat transfer analysis

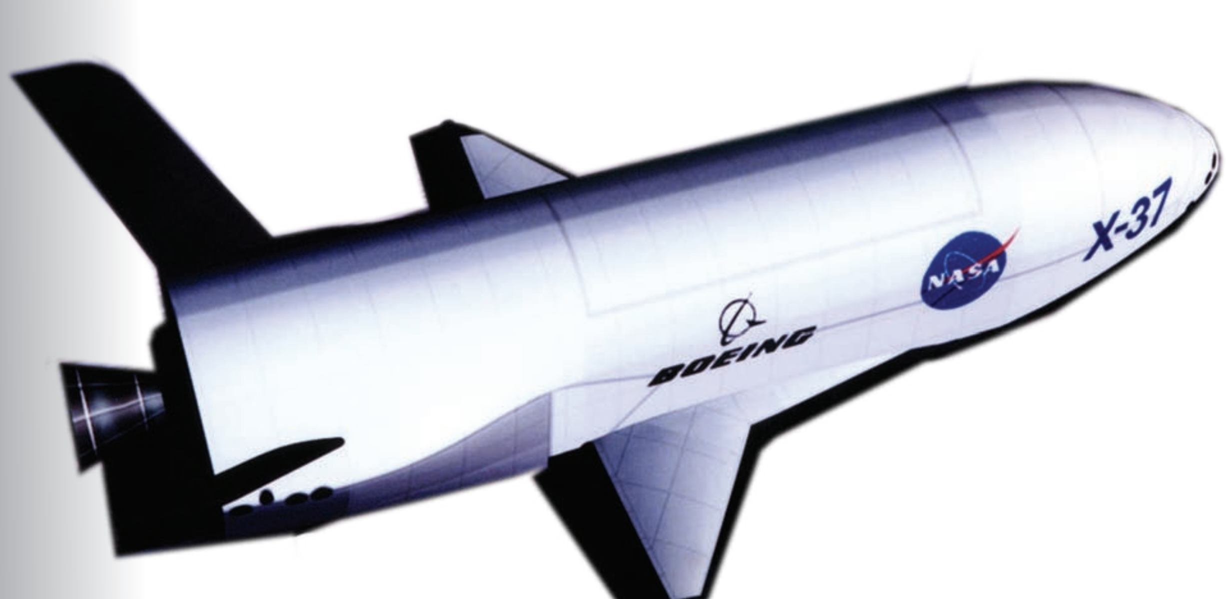
Structural, thermal and dynamic ground-test techniques
- Structural loads calibration and equation derivation
- Thermal/structural testing
- Proof loads testing
- Ground vibration and structural mode interaction testing

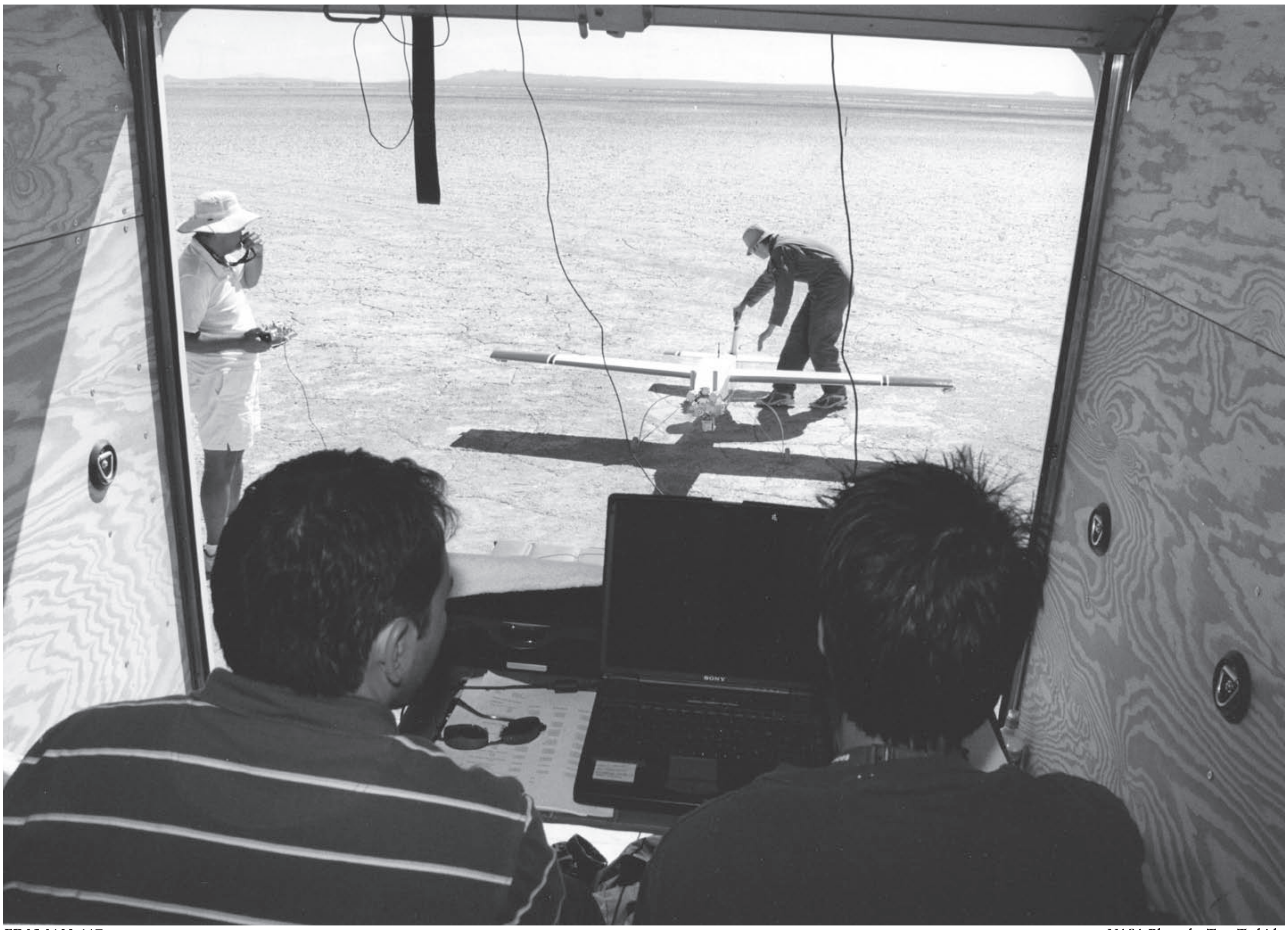
Advanced structural instrumentation
- Strain, temperature, heat flux, deflection
- Fiber-optic strain and temperature sensors

Flight test techniques for analysis validation and safety-of-flight support
- Flight test planning
- Structural and thermal flight data analysis



EC05 0120-1 NASA Photo by Tony Landis





ED05 0138-117 NASA Photo by Tom Tschida

Tony Frackowiak, standing, left, and Tyler Beiter set up the mothership and its underbelly passenger, the Sandia Dart research vehicle while Jose Ruiz, left, and Victor Linn make final preparations in the ground cockpit, to which control of the aircraft will shift during its climb to mission altitude.

Dart

Flight research hits the mark

By Jay Levine
X-Press Editor

Ordinarily, Dryden's expertise is called upon to help engineers avoid burying a flight research vehicle in the desert floor. But Sandia National Laboratories researchers in New Mexico came to Dryden to tap the center's expertise in order to do precisely that: "plant" their dart-like flight research vehicle.

Dryden technicians integrated the Sandia Darts onto the center's utility vehicle aircraft and after several modifications, air launched the Darts from about 3,000 feet in an attempt to characterize the Darts' aerodynamics. The goal of the Sandia research project was to demonstrate the aerodynamic stability and flight performance of the Dart vehicle and embed it in the ground.

Dryden researchers integrated the Sandia-designed drop mechanism on the utility aircraft's underside and were tasked with devising a method of air launching the Darts accurately from a specified position as well as ensuring that they fell to the ground in a place from which they could then be retrieved. Among the challenges was getting the vehicle to embed at or near the ground surface in a variety of soils, said Steve Jacobson, Dryden's chief engineer for the Dart project.

The drop from 3,000 feet required the resolution of another challenge – a projectile as small as the Dart is difficult to see at 3,000 feet above ground level, or about 5,270 feet above sea level. In the past, aircraft released from the center's utility vehicle were launched at lower altitudes.

See Dart, page 14

EC05 0138-10 NASA Photo by Tom Tschida

Mark Howard takes a measurement of how deeply the Dart research vehicle planted itself following an air launch from the mothership.

EC05 0138-106 NASA Photo by Tom Tschida

The mothership takes to the sky with a Sandia Dart research vehicle secured beneath its fuselage. Air launch of the small Darts was successful.

HiWAND

Dryden researchers add network capabilities to telemetry systems

By Beth Hagenauer
Dryden Public Affairs

Dryden researchers have demonstrated in flight a network-enhanced telemetry system that enables connectivity between air and ground, including airborne Internet access. This capability will allow scientists and others to downlink scientific data and uplink critical information to airborne sensors more efficiently than previously possible.

In the Hi-rate Wireless Airborne Network Demonstration, existing computer hardware and off-the-shelf components were used to build a system establishing two-way high-speed communication between aircraft and ground personnel in near-real time.

"The capabilities demonstrated on this project can benefit more than Earth science," said project manager Mark Pestana, who also served as project pilot. "The flight test community or any user who needs bandwidth-intensive interactive data communication between an aircraft and the ground will realize huge benefits."

In addition to sending and receiving e-mails and accessing the World Wide Web for aviation weather information, the system transmitted data in both directions at rates up to 10 megabits per second between the airborne computer and a ground-based station. The feasibility study was sponsored by Dryden's Earth Science Capability Demonstration project, a jointly funded activity involving NASA's Science and Aeronautical Research mission directorates.

"Suborbital Earth science activities of the future demand better capabilities and greater capacity to do productive work on all platform types," said Larry Freudinger, chief engineer for the over-the-horizon networks project. "This experiment demonstrated our ability to construct a network link from existing broadcast telemetry components, thus adapting a half-century of investment in test-range infrastructure for new uses."

Dryden's Beech 200 King Air served as the testbed aircraft for the study, traveling more than 160 miles north of Dryden to conduct the line-of-sight communications experiment. A single rack was mounted in the passenger compartment to house the equipment, including a Global Positioning System and FM receivers, a tiny data router and a telemetry transmitter. The experimenter's laptop computer served as the airborne user interface, transmitting and receiving information via L-Band and S-Band telemetry links.

Pestana said this newly developed high-speed connectivity has applications in unmanned aircraft systems as well as in piloted aircraft. Compared with satellite-based solutions, he said, scientists will be able to receive more data from experiments at lower cost and reply with instructions to instrumentation to maximize efficiency. Time lags in decision-making due to waiting for post-flight downloads would eventually be eliminated. Leveraging global Internet connectivity, researchers can be located at their respective institutions or elsewhere, with virtually immediate access to data for interpretation and analysis.

Submitted photo

Hi-rate Wireless Airborne Network Demonstration, or HiWAND team members include, from left, crew chiefs Andres Hernandez and Mario Soto, project manager and project pilot Mark Pestana, operations engineers Ryan Lefkofsky and Matt Graham, instrumentation engineer Howard Ng, operations engineer Ron Wilcox, principal investigator Russ Franz, instrumentation engineers Richard Hang and Shedrick Bessent and range systems engineer Darryl Burkes.

"This would be especially important in weather studies where time-critical prediction of storm movement is essential," Pestana added.

Researchers anticipate conducting further flights that would demonstrate air-to-air and over-the-horizon relay capabilities, extending the useful reach of this network link. The long-term goal, according to Freudinger, is to develop and implement a dependable network-enhanced communication architecture that maximizes the ability of any instrument on any platform to communicate with any other entity anywhere, using whatever wireless data links that platform might have available.

"The Hi-rate Wireless Airborne Network Demonstration concept is another step in that direction," he said.

Principal investigator Russ Franz noted, "I consider this successful demonstration as enabling a paradigm shift in the way flight test projects are designed and conducted. Researchers will soon have seamless access to and control over their experiment in ways that can only be realized through a high-speed airborne network extension."

In addition to Pestana and Freudinger, HiWAND team members include Andres Hernandez, Mario Soto, Ryan Lefkofsky, Matt Graham, Howard Ng, Ron Wilcox, Russ Franz, Richard Hang, Shedrick Bessent, Darryl Burkes, Russ James, Tim Miller and Frank Cutler.

Microgravity experiment is fun for Earth-bound Cole students

By Beth Hagenauer
Dryden Public Affairs

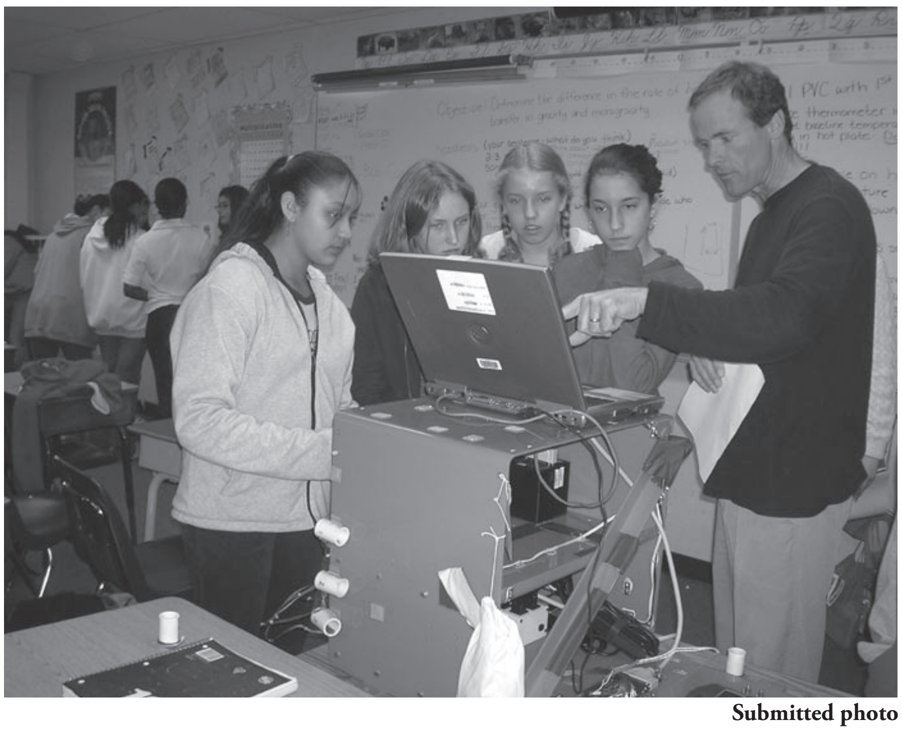
The students were making bets while the teachers were saying it wouldn't happen. The debate centered on which of two Cole Middle School teachers would become airsick while participating in a flight experiment onboard NASA's C-9, or "Weightless Wonder."

Margo Deal and Dorothy Smith are math and science teachers at Cole, a NASA Explorer School in Lancaster. With the help of their science classes, the two proposed a project with the objective of determining whether the rate of heat transfer through a variety of solid and liquid materials would change in microgravity as compared with how it reacts in Earth's gravity.

After a delay due to Hurricane Katrina, the flights took place in mid-February at Johnson Space Center, Houston. Accompanying Smith on the Feb. 16 flight was Bob Curry, aerospace engineer and acting director of Dryden's Science mission directorate.

Curry volunteered to be mentor for the project. He helped with hardware support to bring the experiment to fruition and coordinated with the necessary Dryden laboratories to ensure the experiment met flight safety standards.

Dryden Explorer School coordinator Linda Tomczuk flew with Deal on Feb. 17. Tomczuk was instrumental in submitting the experiment proposal, which had been selected from a field of NASA Explorer School competitors. Following each flight, the teachers communicated with their classes through video teleconferencing and e-mail.



Submitted photo

Bob Curry, aerospace engineer and acting director of Dryden's Science mission directorate, shows students some of the readings of a microgravity experiment that their teachers tested on NASA's C-9 "Weightless Wonder." Students pictured, from left, are Maria Lopez, Niki Erickson, Rachel Thomson and Katie Thomson. The experiment tested whether the heat transfer through a variety of solid and liquid materials would change in microgravity.

Deal called her ride, "Awesome – the most incredible ride of my life."

These four joined a group of teachers from around the U.S. in sharing the unique experience outside the bounds of gravity aboard the modified C-9. The aircraft, similar to a DC-9 airliner, produces 25 seconds of weightlessness by flying in a roller coaster-like path, or parabola, climbing and diving steeply.

Curry visited the school last spring to explain the experiment, which was flown bolted to the floor of the C-9. Curry demonstrated how seven small containers made from PVC pipe the size of 35mm film canisters were placed individually on a hot plate during short periods of microgravity. Several of the containers were filled with a liquid such as soda, another with air and one was a small copper cylinder. Three temperature sensors inserted at the top, middle and bottom of the containers fed temperature readings to a laptop computer attached to the equipment rack containing the experiment's instrumentation.

Deal's sixth-grade students worked in groups to replicate the study in their classroom gravity environment. The groups chose one of the liquids, or air, and filled their small container. It was placed on a hot plate and a baseline temperature was established, followed by measuring the degrees of change at 15-second intervals for four minutes. Their homework assignment was to write a hypothesis for the experiment. When the final results of the microgravity sampling are complete, the students will make comparisons to their classroom samples.

Sixth-grader Katie Thomson said that Deal's flight on the C-9 "helped students fully understand the chapter," referring to the science chapter that met state standards on teaching heat convection. Thomson felt

See Experiment, page 16

ED05 0201-17 NASA Photo by Tom Tschida

The Pathfinder-Plus Flight Project Team earned a NASA Group Achievement Award in recognition of the Pathfinder-Plus investigative flights to determine aeroelastic response characteristics to validate complex modeling and analytical tools.

Awards

... from page 7

executing daily flight scheduling coordination for flight research activities at Dryden.

• Peters – For sustained demonstration of technical and leadership excellence in the conduct of nationally significant flight research projects.

Also at the event, two Outstanding Leadership medals were awarded to John Carter and Susan B. Miller, and Jerry S. Reedy and Michael Monahan were honored with Exceptional Public Service medals.

The citations read:

• Carter – For outstanding leadership as the project manager on the Intelligent Flight Control project and as the director over flight research and science projects at Dryden.

• Miller – For outstanding leadership of the NASA Dryden Flight Research Center's academic initiatives, investments and programs.

• Reedy – For a lifetime of innovative technical achievements on generations of NASA flight vehicles, from the X-1E and X-15 to the space shuttle orbiter.

• Monahan – For consistent success in keeping Dryden's mission-critical facilities fully operational and providing innovative, motivational and cost-effective leadership for every project and modification.

In addition to the awards for individuals, seven group awards were presented.

• The Active Aeroelastic Wing team demonstrated for the first time the use of wing warping for aerodynamic roll control with modern aircraft, while at the same time controlling structural loads.

John F. Carter is the team leader and team members include:

NASA

Michael Allen	Dick Ewers
Christina Anchondo	Russ Franz
Ivan Anchondo	Phil Gonia
John Baca	Don Hermann
Marty Brenner	Joe Hernandez
Alan Brown	Kathleen Howell
Randy Button	Mike Kehoe
Bob Clark	Linda Kelly
Steve Cumming	Kevin Knudtson
Ryan Dibley	Andrew Lizotte
Corey Diebler	Bill Lokos
Jessica Lux-Baumann	Carrie Rhoades

See Awards, page 13

EC05 0149-1 NASA Photo by Bill Ingalls

The ER-2 Airborne Science Tropical Cloud Systems and Processes Team was recognized for conducting a highly successful deployment to Costa Rica to gather data on the buildup and behavior of tropical storm systems. Above, the ER-2 departs San Jose, Costa Rica, on one of its missions to monitor tropical storms and the formation of hurricanes.

EC06 0091-2 NASA Photo by Tom Tschida

The NASA Dryden Public Affairs, Commercialization and Public Outreach office was recognized for outstanding support of three events in August 2005: the landing of Discovery, its return to Kennedy Space Center, Fla., and the X-15 astronaut wings program.

Awards ... from page 12

Adam Matuszeski
Jim Mills
Tim Moes
Leslie Molzahn
Larry Myers
Gayle Patterson
Marlin Pickett
Dana Purifoy
Thang Quach
Fred Reaux
Matt Reaves
Stephanie Rudy
Keith Schweikhard
John Stripe
Pat Stoliker
John Theisen
Daryl Townsend
David Voracek
Don Warren
Don Whiteman
Mae Yook Wong

Aerotherm
Dallas Quantz

AS&M
Michael Arebalo
Denis Bessette
Ronnie Boghosian
April Doss
Joe Gera
Bill Hunter
Sim Taylor

CSC
Linda Soden

Dyncorp
Jori Cheney

GRD Inc.
Lynn Faith
Janet Gilmann

Infinity Technology Inc.
Shalane McGee

Spiral Technology Inc.
Mike Earls
Rick Stauf

• **The ER-2 Airborne Science Tropical Cloud Systems and Processes Team** was recognized for conducting a highly successful deployment to Costa Rica to gather data on the buildup and behavior of tropical storm systems.

The team leader is Michael Kapitzke and the group includes:

NASA
Robert Curry
Glenn Hamilton
Chris Jennison
Gary Kellogg
Walter Klein
Jeanette Van Den Bosch
David Wright

Arcata Associates
Robert Joens

AS&M
Gloria Fields
Sky Yarbrough

Infinity Technology Inc.
Rhonda Everest

Lockheed Martin
Dennis Avila
Jim Barnes
Brent Biebler
John Bryant
Gayle Coghan
Wayne Deats
Gregg Don Carlos
Larry Esperanza
Mike Lakowski
Joseph Niquette
Dee Porter
David Proto
Ryan Ragsdale
Jerry Roth
Jim Sokolik
Ed Vadnais
Larry Walter
Robert York

Scientific & Commercial Systems Corp.
Lea Ames

United Paradyne
Ron Bailey
Wendy Given
Kevin Kraft

• **The F-15B Lifting Insulation Foam Trajectory Team** earned its NASA Group Achievement Award for providing timely flight research test information on thermal protection foam separation to the shuttle return-to-flight team.

Ting Tseng was the team leader and team members included:

NASA
Paul Aristo
Andrew Blua
Craig Bomben
Young Choi
Art Cope
Stephen Corda
Robert Garcia
Brian Hookland
Ryan Lefkofsky
Roger Lynn
Lesa Marston
Martel Martinez
Kendall Mauldin
Matthew Reaves
Mark Smith
James Smolka
Clinton St. John
Howard Trent
Kimberly Vaughn
Christine Visco
Donald Whiteman
Donald Whitfield
Mae Yook Wong

AS&M
Ken Cross

GRD Inc.
Candace Mertes

Spiral Technology Inc.
Keith Krake

• Recognition was bestowed on **the Joint Unmanned Combat Air Systems X-45 Team** for achieving historic milestones, advancing the technology of autonomous air vehicles and demonstrating single- and multi-vehicle autonomous operations.

Gary S. Martin was the team lead and members of the team include:

NASA
Gary Cosentino
Loc Bui
Richard G. Ewers
Gordon Fullerton
Freddie L. Graham
Ross Hathaway
Anthony Kawano
Patricia Kinn
David McAllister
Charles McKee
Bill McMullen
Jim Smolka
Michael Young

• **The NASA Dryden Public Affairs, Commercialization and Public Outreach office** was recognized for outstanding support of three events in August 2005: the landing of Discovery, its return to Kennedy Space Center, Fla., and the X-15 astronaut wings program.

Michael Gorn is the team leader. Team members are:

NASA
Alan Brown
Fred Johnsen
Kim Lewis
Steve Lighthill
Greg Poteat
Leslie Williams

AS&M
Ronnie Boghosian
Gray Creech
Bill Dana
Christian Gelzer
Beth Hagenauer
Mary Ann Harness
Jay Levine
Terri Lyon
Lisa Mattox
Peter Merlin
Sarah Merlin
Curtis Peebles
Debbie Rodden
Mary Whelan

• **The Pathfinder-Plus Flight Project Team** earned a NASA Group Achievement Award in recognition of the Pathfinder-Plus investigative flights to determine aeroelastic response characteristics to validate complex modeling and analytical tools.

Robert Navarro was the team lead for this group that includes:

NASA
Gabriel Baca
Dan Banks
Alan Brown
Maria Caballero
Tom Cronauer
Ken Cross
John Del Frate
Jack Ehrenberger
Tony Ginn
Tony Kawano
Art Lavoie
Lori Losey
Lesa Marston
Terry Montgomery
Dennis Morehouse
Mauricio Rivas
Bart Rusnak
Ed Teets
Kevin Walsh

AeroVironment
Win Banning
Carol Brennan
Jim Daley
Kirk Flittie
Casey Heninger
Wyatt Sadler
Stuart Sechrist
Mark Shipley
Greg Kindall
Derek Lisoki
Jason Mukherjee
Doug Profitt
Andrew Rutgers
Dana Taylor
Jan Wurts

Arcata Associates
Gregg Bergmann
Brandy Rennie
Tom Tschida

AS&M
Ken Cross
Casey Donohue

Scientific & Commercial Systems Corp.
Debbie Ackeret

Infinity Technology Inc.
Shalane McGee

Ray Morgan Aircraft
Ray Morgan

• **The Shuttle Support Group** earned a NASA Group Achievement Award for sustained excellence during the two-and-one-half-year hiatus in shuttle flights, culminating in an extremely successful recovery during Discovery's return-to-flight mission.

The team is led by Joseph D'Agostino and includes:

NASA
Gabriel Baca
Tom Barlow
Gary Beard
Gregg Bendrick
Mike Gorn
Dave Jones
Ryan Lefkofsky
Steve Lighthill
Martel Martinez
David McAllister
William Robinson
Daryl Townsend
Kimberly Vaughn
Don Warren
Leslie Williams

Arcata Asssociates
Richard Batchelor
Gregg Bergman
Doug Boston
Tilley Boston
Tim Burt
Fred Chatterson
Rick Dykstra
Sarah Eddy
Tim Elersich
Tom Facer
Anthony Fields
Monica Garvin
Al Guajardo
Bob Guere
Steve Hansen
Lynette Jones
Todd Kunkel
Tony Landis
Lori Losey
Peter Merfa
Tim Miller
Darren Mills
Stacey Mills
Jeff Nelms
Dave Owens
Steve Parcel
James Pavlicek
Tim Peters
Pat Ray
Brady Rennie
Jim Ross
George Rothmaller
Hector Rodriguez
Trace Short
Carla Thomas
Justin Thomas
Tom Tschida
Mike Webb
Donna White
Tracey Willis

AFFTC
Bill Gries
Mike King
Donna Kowaleski
Larry Ledford
Dave Mann

AS&M
Emmanuel Brooks
Richard Elliott
Dave Plummer
Jonathan Spradlin
Patrick Taylor

CSC-747
Jim Bedard
John Goleno
Arvid Knutson
Pete Siedl
Todd Weston

Kay & Associates
Ron Johnson
Pete Peterson
Joe Salasavage

Lockheed Martin
Irv Armstrong
John Booksha
Betsy Booth
A.J. Christiansen
Lance Dykhoff
Bill Geimke
Shirley King
Heidy Molina
Ray Mowery
Vicki Nault
Andy Olvera
Tom Percival
Jose Rivera
John Sammons
Juan Santos
Roy Torrez
John Wood III

Platinum International
Dean Lebret

STG International
Kristy Barnett
Kathie Benn
Jennifer Decker
Vicki Johnson
Kathleen Kirk
Claire Sleboda
Kathleen Walter

USA
Phil Burkhardt
Diane Cox
Joe Dodson
Ron Kariger
Chris Leigh
Mike Mercer
Tri Truong

In addition to receiving NASA awards, Dryden employees were recognized for 20, 25, 30, 35, 40 and 50 years of service.

20 Years
Jeffrey Ervin Bauer
Terrance L. Blankenship
Georgina R. Branco
John F. Carter
Eileen V. Detka
Bradley C. Flick
Thomas J. Grindle
Michael S. Kapitzke
Deborah M. Koehler
Dennis V. Morehouse
Jill Marie Neville
Paul Reukauf
Kimberly Ennix Sandhu
Ronald J. Sun
Valerie J. Zellmer

25 Years
David Anthony
John T. Bosworth
Mariaelena A. Chacon
William H. Crews
Jeffry W. Doughty
George H. Grimshaw
Linda E. Hoge
Frederick A. Johnsen
David A. Jones
Gary V. Kellogg
Nick C. Kiriokos
Arthur Lavoie Jr.
Edwin W. Lewis Jr.
James E. Mills
Denise Orta-O'Neill
Knut N. Roepel
Richard D. Rowland
Peter T. Sidoti
Mark A. Skoog
Robert L. Tryon
Randy L. Wagner
Kenneth D. Wilson
Howard D. Winsett Jr.

30 Years
John J. Burken
Lawrence Camacho
Claude V. Chacon
Walter E. Chase
James M. Hillman
William A. Lokos
Gary S. Martin
Gregory A. Poteat
Lawrence J. Schilling
Edmund K. Swan
Richard Swanson
Jack P. Trapp

35 Years
John R. Denman
Richard R. Larson
Richard E. Maine
Kevin L. Petersen
Jimmie L. Shehane

40 Years
Russell H. Davis
Glenn M. Sakamoto

50 Years
William P. Albrecht

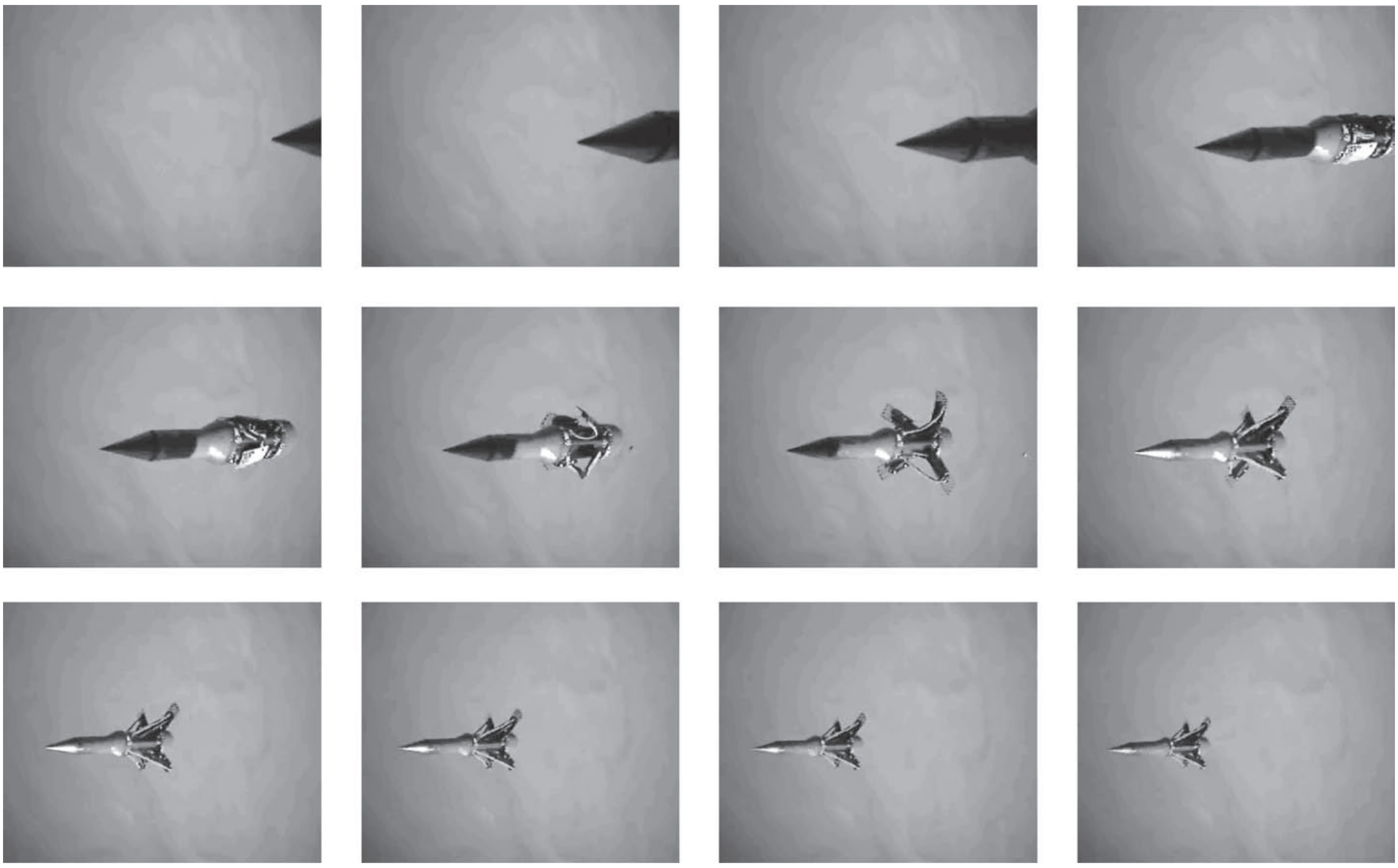


Photo sequence assembled from mothership onboard camera footage by Tyler Beiter

Dart ... from page 10

"We had to put an autopilot on board to control our utility airplane because it flies so high that the pilot would have a difficult time controlling it," Jacobson explained.

Dryden Model Shop designer Tony Frackowiak said the integration of the equipment wasn't the difficult part. The utility model was designed for missions like air launching the 28-pound, 30-inch-long Dart, and integrating the autopilot was not hard. Mounting the four cameras on the aircraft, however, was a different story.

One video camera was added to each wingtip, one "chin" camera near the front of the aircraft to capture video of the Dart falling away and one at the tail. The camera work was for Dryden's benefit and it added a new capability for future flight experiments.

Additionally, Frackowiak said, completing simulations of how the hardware would work in the integrated systems and deriving the mathematical parameters, or gains, for the autopilot were challenging.

Once the aircraft was ready and the 14 Dryden and five Sandia Laboratories personnel had completed preparations, it was time to fly. As is often the case with flight research, not everything went as planned.

"We became involved because we know how to fly airplanes and we know how to drop things off of airplanes," Jacobson said. "Sandia needed our help with the drop operations, providing the UAV and the infrastructure to support its flight. A primary objective of the test was (that) they wanted to be able to find it (after it came to rest on the ground). The very top of the Dart is the only thing that is supposed to be visible. In fact, the very first time we dropped it, it wasn't easy to find."

But researchers had a good idea of where to look.

"We knew where it was supposed to be but winds were pushing it to one side," Jacobson said. "We had people stationed at various points and they walked line-of-sight to where they thought it would be. We knew based on the wind that the drop article would be in an oval-shaped area. When (researchers) walked to the same area from their position, we were literally within five feet of it and didn't know. It wasn't obvious to us."

A feature of autopilot was auto drop, which enabled researchers to know the Dart's path and direction and the point at which air launch would occur. Knowing the point of origin made finding the Dart easier after the first time, Jacobson said.

The autopilot was an off-the-shelf product, Cloud Cap Piccolo Plus hardware and guidance software. The autopilot used in the Sandia Darts project also was used in another Dryden project, Michael Allen's autonomous soaring research. Allen customized the autopilot so his hand-launched, motorized, model sailplane would catch plumes of rising air called thermals in much the same way as birds do, validating a thermal model developed at Dryden.

Dryden's ability to operate in restricted airspace is another unique feature of testing at the center, he added.

"Sandia wanted to show their drop article to their customer," he said. "The day we showed it (to their customer representatives) we had two drops and the operation was flawless. Because we had invested so much time in understanding the systems and practiced with a 'dummy Dart,' we had plenty of operational experience before the customer showed up. The day the customer showed up, things went off without a hitch."

Dryden's utility aircraft has a 10-foot wingspan, is nine and one-half feet in length and weighs about 30 pounds in standard configuration. Takeoff weight for the Dart project was 76 pounds, the most the aircraft has carried, but Frackowiak said the aircraft likely could carry even heavier payloads with the larger engine he installed for the Sandia mission.

EC05 0138-33 NASA Photo by Tom Tschida

At top, a series of frames captured with a video camera on the "chin" of the mothership shows the Dart research vehicle as it is air launched. Above, Tyler Beiter, left, and Jim Murray go over some details on the launch aircraft before it takes to the sky and drops the Dart research vehicle. The flight series was a success, helping Sandia National Laboratories researchers prove the Darts' aerodynamics and validating new capabilities for the mothership.

The Sandia-designed release mechanism consisted of a mounted, four-jaw "clamshell" that opens to allow the object to air-launch on release. It was spring-loaded with a pyrotechnic cutter to ensure the mechanism worked as intended. The Darts also can be released manually.

Jacobson described the Darts' release from the utility vehicle as "smooth as glass."

"We have added a unique capability to the utility vehicle that increases the air-launch altitude from 1,000 to 3,000 feet, and it could go higher with this autopilot. The utility vehicle worked great and the releases were very smooth," he said.

The autopilot is a new capability for the utility vehicle that is expected to have applications for future research.

"It certainly can be used for a variety of research – projects similar to the Darts, or any test item that needs to be flown," Frackowiak said.

Dryden also is working to develop a UAV trainer or proficiency system, which was really (the late Dryden engineer) Dale Reed's vision for the utility project, he added.

Frackowiak said the Dart demonstration flight also illustrated Dryden's capability with small UAVs.

"Subscale or smaller UAVs can accomplish many research objectives at a much lower cost and a shorter time frame," he said.

Blended Wing Body ... from page 1

ment to maximize payload capacity. The tips of the airfoils end in winglets to reduce drag and thereby increase fuel efficiency. A big difference between the BWB and the traditional tube and wing aircraft is that instead of a conventional tail the BWB relies solely on multiple control surfaces on the wing for stability and control.

Boeing officials see the BWB as a flexible, long-range, high-capacity military aircraft that could be used as a tanker, transport, command and control platform or weapons carrier.

Designed to fly at altitudes around 7,500 feet, the X-48B's average research flight is expected to last about an hour and will be focused on low-speed flight characteristics, said Gary Cosentino, Dryden's Blended Wing Body project manager and chief engineer. The first in a series of about five developmental research flights are scheduled to take place later this year or in early 2007.

The aircraft, featuring a 21-foot wingspan, recently underwent a paint job at Cranfield Aerospace Ltd. of Cranfield, England, a subcontractor on the project, and arrived at Dryden with some assembly required. The wings and landing gear were detached for transport and additional work is needed to prepare the aircraft for research flights. The X-48B will fly with a gross takeoff weight of about 400 pounds. A second BWB aircraft recently underwent a series of tests in NASA wind tunnels at Langley Research Center, Hampton, Va.

A successful set of five check-out flights with the X-48B, Cosentino said, could herald the start of a 20- to 25-flight follow-on project that could last an additional six to nine months and further define the flight characteristics of the aircraft as the flight envelope is expanded.

"It's not so much maturing new technologies as it is working to understand the characteristics of the shape," he explained.

Dryden is one of several partners in Boeing Phantom Works' Blended Wing Body concept research efforts, which also include work by Cranfield, the Air Force Research Laboratory, Langley and the NASA Subsonic Fixed Wing Program, the latter a key component of the agency's Aeronautics Research mission directorate.

Blended Wing Body aircraft concepts have been studied since the early 1990s and testing of the shape's aerodynamics has been conducted in Langley wind tunnels. Flight research is a welcome next step, said Fay Collier, NASA's Langley-based Fixed Wing Project principle investigator.

"We have computational and ground-based testing," Collier said. "This flight test is going to fill in the flight part of the data for the low-speed flight regime. It will give us a really good set of data, from ground to flight, and in this particular case we're looking at low-speed flight data to go along with computation and wind tunnel test data we've acquired. It's the final straw in acquiring test data for that configuration."

In addition to looking at simulation models, stability and control limits of the aircraft and control laws for the unique tailless vehicle, Collier said NASA also is interested in potential benefits in the areas of noise reduction, lower emissions and aircraft performance.

"This particular configuration is useful in a number of ways. There are combinations of engines and airframes, like this one, that may lead to significant noise reduction. This configuration is expected to be – for a very similar payload – much more fuel efficient than a conventional configuration," Collier said.

Boeing Phantom Works engineers in Huntington Beach, Calif., specified the X-48B's outer mold line – the external shape of the airplane – using their aerodynamic design methods. That information was sent to Cranfield in a computer-aided design file. Cranfield built the blended wing body airplane to Phantom Works engineers' specifications, which are critical to testing a unique aerodynamic design. Phantom Works is Boeing's advanced research and technology organization.

ED06 0107-17 NASA Photo by Tony Landis

Boeing Phantom Works employee Rod Wyatt readies the X-48B blended wing body aircraft for a set of research flights to be flown later this year or in 2007. Research with the X-48B could result in development of aircraft capable of carrying larger payloads with greater fuel efficiency.

ED06 0107-22 NASA Photo by Tony Landis

Andy Walster of Cranfield Aerospace takes the stick of the X-48B blended wing body aircraft simulator.

Testing of the X-48B, the Blended Wing Body aircraft, recently concluded in the Langley Research Center wind tunnels in Hampton, Va. The aircraft has since come to Dryden to serve as backup to the primary X-48B research vehicle, which should begin checkout flights later this year or in early 2007.

Photo courtesy The Boeing Company

Boeing officials envision the aircraft as a multi-role platform for military purposes capable of a wide range of applications, said Norm H. Princen, Boeing Phantom Works X-48B chief engineer.

"We're really trying, with this vehicle, to prove out the technologies that would enable a Blended Wing Body to be built," he said.

Depending on customer need, a next step could be a production aircraft, Princen said, though a more complicated set of requirements could lead to a larger demonstrator.

Dave Dyer, Cranfield Aerospace General Manager of UAV Systems and Cranfield's BWB general manager and chief engineer said the company's role on the project encompasses more than structures work.

"We've designed and built all the avionics and installed them in the aircraft and the ground station," Dyer said on a recent visit to Dryden. "We're supplying a system, not just an airframe. We see it as we're providing a facility to enable (Boeing) to upload their flight control laws into the vehicle for experimentation. The job is not compartmentalized as it might seem; it's an interactive job."

The decision to conduct X-48B flight research at Dryden was an easy choice, Princen said.

"Dryden is a fantastic place to do flight testing. The facilities here are really tailored to doing the flight test job and there is really no other facility like it in the country. The large open space where we can get airspace set aside for our use, right over the lakebed, makes a great emergency landing opportunity if you have to do that. Because we're dealing with an experimental aircraft, you never know quite what's going to happen.

"The staff here at Dryden have done many other X-plane projects in the past and we gain from that experience," he continued. "They're telling us a lot of things that are going to help us avoid problems."

The technical expertise of Dryden's staff has been tapped for specific tasks, Cosentino said. Dryden team members include Chris Regan, flight controls; Richard Main, aerodynamics in parameter identification; and operations engineer Kimberly Vaughn. Also working on the project are Jessica Lux-Baumann from the Western Aeronautical Test Range and Tony Kawano, Range Safety Systems Office. Frank Batteas and Marty Trout are providing support with piloted simulations.

Dryden's experience with former X-planes is long.

"The past is applicable," said Cosentino, who was project manager for the unmanned X-36 and X-45 vehicles. "Every time we fly a subscale vehicle, we learn something. All the lessons learned from those two vehicles will be taken into account in general."

The X-36, for example, was similar to the Blended Wing Body in that it was piloted from a ground station. Better interface with the pilot is one lesson resulting from that research that will be applied to work with the X-48B.

Dryden's experience with Altair also contributes to a foundation of work with UAVs that will help shorten the learning curve on the X-48B, Cosentino concluded.

This dynamic view of the center (ED06 103-73) was captured June 23 by Dryden photographer Carla Thomas on Family to Work Day. Thomas was a passenger in a T-34 piloted by Gordon Fullerton during two flyovers. The T-34 flew with a F/A-18 on one pass and then each aircraft completed a second pass individually. Pilot Jim Smolka and Dave Wright were in the F/A-18.

Family Day

... from page 5

it lands at Dryden, without the need for stairs. The mobile unit then transports crewmembers directly to the Dryden Health Unit.

Family Day activities also helped spark enthusiasm and provide funds for events that will commemorate Dryden's 60th anniversary. A bake sale and book sale fed the sweet tooth and the minds of many, raising $498 and $275, respectively. More details and information about anniversary events will be available in future editions of the X-Press, Special Delivery and on the Dryden X-net. A Nov. 4 gala is among events set to commemorate the anniversary.

Hot Structures

... from page 9

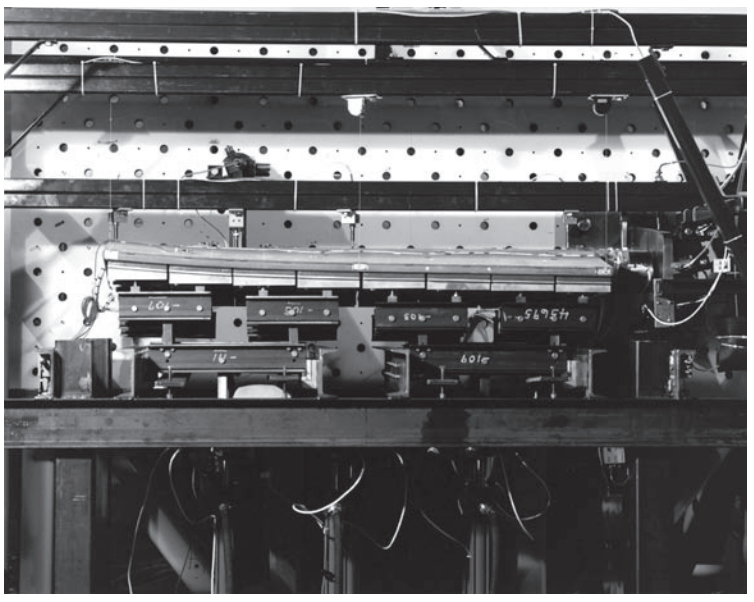
and lessons learned from that and other loads labs projects as a database that can be available for hypersonic research within NASA's Aeronautics program. Using that information to advance technologies required for development of next-generation hypersonic vehicles is where the loads lab could potentially make the greatest contribution.

"Our goal," said Hudson, "is to provide accurate data under simulated flight conditions to analysts so they'll have the best possible opportunity for validating their models of advanced hot-structures and thermal protection materials.

"As a follow-on goal, we want to take the validated high-fidelity models and come up with the tool or tools that can be used to simplify the model so that it can run faster, yet contain all of the pertinent information necessary for vehicle designers to do their job more accurately and efficiently."

In addition to providing information for physics-based modeling design and analysis and optimization tools, Hudson sees a practical role for the lab in helping companies advance aeronautics data. For example, a company needing to qualify a part, subsystem or even an entire aircraft for use at temperatures up to 3,000 degrees Fahrenheit could tap loads lab personnel to conduct the necessary tests.

"Our plan is to partner with private industry and other government entities through cost-sharing agreements in an effort to advance structural technologies that are useful to not only our customers, but also to NASA and the technical community," he said.



EC05 0197-28 NASA Photo by Tony Landis

The car-bon-carbon X-37 flaperon qualification unit undergoes mechanical qualification testing.

Drill

... from page 3

the hospital by ambulance.

Coordinating resources in an emergency situation was among valuable topics brought to light by the aircraft-fire scenarios, said Andres Hernandez, a crew chief.

In the exercise, participants were asked to write down answers to questions about what role they would play in six different emergency scenarios. Three observers also took notes for a report to be written about the activity at a later date. The exercise focused on preparing for a multitude of variations on emergencies that center staff could potentially encounter on any given workday.

Clearly identified roles will keep duplication of effort to a minimum and allow maximum attention to the emergency at hand, participants agreed. The exercise also gave people a glimpse into activities in areas of the center other than their own, and into the duties for which employees in those areas would be responsible. For example, participants learned who impounds records and who secures an area until a preliminary investigation is complete.

In addition to satisfying requirements of Dryden's Aviation Safety Plan, the exercise also met FEMA's annual requirements for emergency preparedness and exercises.

Experiment

... from page 11

this was a "once-in-a-lifetime experience," calling this the best academic year she has had and saying it has been "a lot of fun."

Her twin sister Rachel added that students compared the results of their classroom experiment with Deal's on the C-9.

"The difference was that we are sitting in a classroom and not flying," she said, adding that to complete this experiment, students learned to convert temperatures taken with a Celsius thermometer into Fahrenheit.

The twins are daughters of Dryden's deputy director for flight operations, Mike Thomson.

Fellow student Billy Sitz commented that he "never thought I would be in a class like this with a big experiment." Sitz found that Gatorade heated faster than water. He is the son of Joel Sitz, Dryden's director of the Exploration mission.

At one point, when the students' enthusiasm grew in the classroom, Deal admonished the students in jest, "You're in school. You're not supposed to have fun." But the experiment had successfully merged fun with learning.

The students, incidentally, lost their bets. The two teachers proved their mettle; neither became airsick.

The NASA X-Press is published for civil servants, contractors, retirees and people with interest in the work of the Dryden Flight Research Center.

Editor: Jay Levine, AS&M, ext. 3459

Assistant Editor: Sarah Merlin, AS&M, ext. 2128

Managing Editor: Michael Gorn, NASA

Address: P.O. Box 273, Building 4839
Edwards, Calif. 93523-0273
Phone: (661) 276-3449
FAX: (661) 276-3566

Dryden Home Page:
http://www.dfrc.nasa.gov/

National Aeronautics and Space Administration

Dryden Flight Research Center
P.O. Box 273
Edwards, CA 93523-0273

Official Business
Penalty for Private Use, $300

PRSRT STD
U.S. POSTAGE PAID
NASA
PERMIT #4593